**WHAT IS CLAIMED IS:**

1. A method of identifying a defect comprising the steps of:

providing a wafer having a surface;

providing a non-vibrating contact potential difference sensor;

scanning the semiconductor wafer relative to the non-vibrating contact potential difference sensor;

generating contact potential difference data from the non-vibrating contact potential difference sensor; and

processing the non-vibrating contact potential difference sensor data to automatically detect a pattern that represents the defect.

2. The method as defined in Claim 1 further comprising the step of determining a scanning height of the non-vibrating contact potential difference sensor.

3 The method as defined in Claim 2, wherein the step of determining the scanning height comprises

positioning a height sensor that is fixed relative to the non-vibrating contact potential difference sensor;

measuring a distance between the height sensor and the wafer; and

correlating the height sensor measurements with the non-vibrating contact potential difference sensor position.

4. The method as defined in Claim 3, wherein the step of determining the scanning height further comprises providing a time-varying bias voltage, and further wherein the height sensor is the non-vibrating contact potential difference sensor.

5. The method as defined in Claim 1, further comprising the step of determining a reference point.

6. The method as defined in Claim 5, wherein the reference point is the center of the wafer as determined by:

positioning the non-vibrating contact potential difference sensor sensor above the wafer;

spinning the wafer;

detecting at least three features on the surface of the wafer; and

calculating the center of the circle defined by the at least three features.

7. The method as defined in Claim 6, further comprising the step of determining a height profile of the wafer by the steps of:

positioning the height sensor above the center of the spinning wafer; and

moving the height sensor to the outer edge of the wafer.

8. The method as defined in Claim 7, further comprising the step of determining the diameter of the wafer.

9. The method as defined in claim 1, wherein reducing the noise further comprises deconvoluting the sensor data.

10. The method as defined in Claim 1 further comprising the step of reducing the noise in the non-vibrating contact potential difference sensor data.

11. The method as defined in Claim 10, wherein the step of reducing the noise further comprises:

decomposing the non-vibrating contact potential difference sensor data into a wavelet domain;

producing a series of wavelet coefficients at a finite number of scales;

reconstructing the data using only fine scales; and

shrinking the fine scales based on a given threshold.

12. The method as defined in Claim 11, wherein the peak signal is selected by selecting only wavelet coefficients at fine scales and by shrinking the fine scale coefficients based on a threshold.

13. The method as defined in Claim 12 wherein the threshold is determined by a wavelet thresholding method selected from the group consisting of "Visu", "SURE", "Hybrid", and "MiniMax".

14. The method as defined in Claim 1, further comprising the step of removing a time delay from the non-vibrating contact potential difference sensor data.

15. The method as defined in Claim 1 further including the steps of:

displaying the contact potential difference data on a display to generate a characteristic wafer image; and

comparing the characteristic wafer image with stand images to identify the category of defect present on the surface of the wafer.

16. The method as defined in Claim 1, wherein the step of processing the sensor data includes assembling of the sensor data into an image that is displayed to the user for evaluation by the user.

17. The method as defined in Claim 1, wherein the step of processing the sensor data includes automatically processing the sensor data to identify the category of defect detected.

18. The method as defined in Claim 1, wherein the scanning step includes moving the wafer.

19. The method as defined in Claim 18, wherein the step of moving the wafer comprises spinning the wafer.

20. The method as defined in Claim 1, wherein the wafer includes at least one additional layer disposed on a base silicon wafer.

21. The method as defined in Claim 1, wherein the defect is taken from the group consisting of a mechanical defect, a chemical defect, an electronic defect, an combinations thereof.

22. The method as defined in Claim 1, wherein the step of scanning comprises the sensor being displaced relative to a fixed form of the wafer.

23. The method as defined in Claim 1, wherein the step of scanning includes moving both the wafer and the sensor.

24. The method as defined in Claim 1, wherein the step of comparing comprises performing a pattern recognition methodology.

25. The method as defined in Claim 1 further comprising the step of processing the wafer with a treatment for ameliorating the category of defect identified.

26. The method as defined in Claim 1 further comprising the step of performing a supplementary analysis.

27. The method as defined in Claim 26, wherein the step of performing a supplementary analysis comprises analyzing chemical contaminants.

28. The method as defined in Claim 27, wherein the step of analyzing chemical contaminants comprises at least one of x-ray photoelectron spectroscopy, Auger spectroscopy and Rutherford backscattering.

29. The method as defined in Claim 1 further including the step of applying a computerized decisional methodology to reject selected ones of the semiconductor wafers having an unwanted category of defect.

30. The method as defined in Claim 1 further including the step of detecting the defect using an edge detection application.

31. The method as defined in claim 30, wherein detecting the defect using the edge detection application comprises the steps of:
generating a CPD sensor peak signal at a boundary between two different areas;
appling an Edge detection application at more than one resolution with different thresholds; and
quantifying contamination level by the edge area over the total wafer area.

32. A method of denoising signal data from a non-vibrating contact potential difference sensor comprising the steps of:

decomposing the signal data into a wavelet domain;

obtaining a plurality of coefficients at a finite number of scales;

selecting for a peak signal; and

reconstructing the data by the coefficients in reverse order.

33. The method of Claim 32, wherein the peak signal is selected by selecting only wavelet coefficients at fine scales and by shrinking the fine scale coefficients based on a threshold.

34. The method of Claim 33, wherein the threshold is determined by a wavelet thresholding method selected from the group consisting of "Visu", "SURE", "Hybrid", and "MiniMax".

35. The method of Claim 32, wherein the signal data is decomposed into the wavelet domain using a wavelet selected from the group consisting of "Coiflet", "Daubechies", and "Symmlet".

36. A method of removing a time delay from a non-vibrating contact potential difference sensor signal comprising the steps of:

modeling the circuit as a first order RC circuit;

converting the non-vibrating contact potential difference sensor signal into a discrete time transfer function;

determining the impulse response of the discretized time transfer function; and

deconvoluting each data track separately.

37. A system for identifying a category of defect on a surface of a wafer, comprising:

a non-vibrating contact potential difference sensor;

a height sensor;

a device for moving the sensor relative to the semiconductor wafer; and

a computer for receiving and analyzing wafer data generated by the sensor and processing the non-vibrating contact potential difference sensor data to automatically detect a pattern that represents a defects.

38. The system as defined in Claim 37, wherein the height sensor is a non-vibrating contact potential difference sensor.

39. The system as defined in Claim 37 further including a data base of images of standard defects, and wherein the computer including computer software which can analyze the

wafer data and compare with the images of standard defects to generate identification information about the type of defect present on the surface of the wafer.

40. The system as defined in Claim 37 further including a transport device to move selected ones of the semiconductor wafers to a secondary processing system having a category of defect which can be remedied.

41. The system as defined in Claim 40, wherein the transport device comprises a wafer handler.

42. The system as defined in Claim 37 further including a plurality of the sensors with one of the sensors disposed immediately downstream from each of a plurality of cleaning systems, thereby enabling monitoring of the semiconductor wafer after processed at each of the cleaning systems.

43. The system as defined in Claim 37, further including a mechanism for automatically determining the cleanliness of wafers and modifying cleaning parameters to improve the cleaning process.

44. The system as defined in Claim 37, wherein the wafer is a semiconductor wafer.